RABAVERT - rabies virus inactivated antigen, a injection, powder, lyophilized, for suspension
Novartis Vaccines and Diagnostics GmbH & Co. KG

Rabies Vaccine for Human Use

DESCRIPTION

RabAvert, Rabies Vaccine, produced by Novartis Vaccines and Diagnostics GmbH & Co. KG is a sterile freeze-dried vaccine obtained by growing the fixed-virus strain Flury LEP in primary cultures of chicken fibroblasts. The strain Flury LEP was obtained from American Type Culture Collection as the 59th egg passage. The growth medium for propagation of the virus is a synthetic cell culture medium with the addition of human albumin, polygeline (processed bovine gelatin) and antibiotics. The virus is inactivated with β-propiolactone, and further processed by zonal centrifugation in a sucrose density-gradient. The vaccine is lyophilized after addition of a stabilizer solution which consists of buffered polygeline and potassium glutamate. One dose of reconstituted vaccine contains less than 12 mg polygeline (processed bovine gelatin), less than 0.3 mg human serum albumin, 1 mg potassium glutamate and 0.3 mg sodium EDTA. Small quantities of bovine serum are used in the cell culture process. Bovine components originate only from the United States, Australia and New Zealand. Minimal amounts of chicken protein may be present in the final product; ovalbumin content is less than 3 ng/dose (1 mL), based on ELISA. Antibiotics (neomycin, chlortetracycline, amphotericin B) added during cell and virus propagation are largely removed during subsequent steps in the manufacturing process. In the final vaccine, neomycin is present at < 1 μg, chlortetracycline at < 20 ng, and amphotericin B at < 2 ng per dose. RabAvert is intended for intramuscular (IM) injection. The vaccine contains no preservative and should be used immediately after reconstitution with the supplied Sterile Diluent for RabAvert (Water For Injection). The potency of the final product is determined by the NIH mouse potency test using the US reference standard. The potency of one dose (1.0 mL) RabAvert is at least 2.5 IU of rabies antigen. RabAvert is a white, freeze-dried vaccine for reconstitution with the diluent prior to use; the reconstituted vaccine is a clear to slightly opaque, colorless suspension.

CLINICAL PHARMACOLOGY

Rabies in the United States

Over the last 100 years, the epidemiology of rabies in animals in the United States has changed dramatically. More than 90% of all animal rabies cases reported annually to the Centers for Disease Control and Prevention (CDC) now occur in wildlife, whereas before 1960 the majority were in domestic animals. The principal rabies hosts today are wild terrestrial carnivores and bats. Annual human deaths have fallen from more than a hundred at the turn of the century to one to two per year despite major epizootics of animal rabies in several geographic areas. Within the United States, only Hawaii has remained rabies free. Although rabies among humans is rare in the United States, every year tens of thousands of people receive rabies vaccine for postexposure prophylaxis.

Rabies is a viral infection transmitted via the saliva of infected mammals. The virus enters the central nervous system of the host, causing an encephalomyelitis that is almost invariably fatal. The incubation period varies between 5 days and several years, but is usually between 20 and 60 days. Clinical rabies presents either in a furious or in a paralytic form. Clinical illness most often starts with prodromal complaints of malaise, anorexia, fatigue, headache, and fever followed by pain or paresthesia at the site of exposure. Anxiety, agitation, irritability may be prominent during this period, followed by hyperactivity, disorientation, seizures, aero- and hydrophobia, hypersalivation, and eventually paralysis, coma and death.

Modern day prophylaxis has proven nearly 100% successful; most human fatalities now occur in people who fail to seek medical treatment, usually because they do not recognize a risk in the animal contact leading to the infection. Inappropriate postexposure prophylaxis may also result in clinical rabies. Survival after clinical rabies is extremely rare, and is associated with severe brain damage and permanent disability.

RabAvert (in combination with passive immunization with Human Rabies Immune Globulin [HRIG] and local wound treatment) in postexposure treatment against rabies has been shown to protect patients of all age groups from rabies, when the vaccine was administered according to the CDC's Advisory Committee on Immunization Practices (ACIP) or World Health Organization (WHO) guidelines and as soon as possible after rabid animal contact. Anti-rabies antibody titers after immunization have been shown to reach levels well above the minimum antibody titer accepted as seroconversion (protective titer) within 14 days after initiating the postexposure treatment series. The minimum antibody titer accepted as seroconversion is a 1:5 titer (complete inhibition in the rapid fluorescent focus inhibition test [RFFIT] at 1:5 dilution) as specified by the CDC (1), or ≥ 0.5 IU per milliliter (mL) as specified by the WHO (2,3).

Clinical Studies

Preexposure Vaccination

The immunogenicity of RabAvert has been demonstrated in clinical trials conducted in different countries such as the USA (4,5), UK (6), Croatia (7), and Thailand (8-10). When administered according to the recommended immunization schedule (days 0, 7, 21 or 0, 7, 28), 100% of subjects attained a protective titer. In two studies carried out in the USA in 101 subjects, antibody titers > 0.5 IU/mL were obtained by day 28 in all subjects. In studies carried out in Thailand in 22 subjects, and in Croatia in 25 subjects, antibody titers of > 0.5 IU/mL were obtained by day 14 (injections on days 0, 7, 21) in all subjects.

The ability of RabAvert to boost previously immunized subjects was evaluated in three clinical trials. In the Thailand study, preexposure booster doses were administered to 10 individuals. Antibody titers of > 0.5 IU/mL were present at baseline on day 0 in all subjects (9). Titers after a booster dose were enhanced from geometric mean titers (GMT) of 1.91 IU/mL to 23.66 IU/mL on day 30. In an additional booster study, individuals known to have been immunized with Human Diploid Cell Vaccine (HDCV) were boosted with RabAvert. In this study, a booster response was observed on day 14 for all (22/22) individuals (11). In a trial carried out in the USA (4), a RabAvert IM booster dose resulted in a significant increase in titers in all (35/35) subjects, regardless of whether they had received RabAvert or HDCV as the primary vaccine.

Persistence of antibody after immunization with RabAvert has been evaluated. In a trial performed in the UK, neutralizing antibody titers > 0.5 IU/mL were present 2 years after immunization in all sera (6/6) tested.

Preexposure Vaccination in Children
Preexposure administration of RabAvert in 11 Thai children from the age of 2 years and older resulted in antibody levels higher than 0.5 IU/mL on day 14 in all children (12).

Postexposure Treatment
RabAvert, when used in the recommended postexposure WHO program of 5 to 6 IM injections of 1 mL (days 0, 3, 7, 14, 30, and one optionally on day 90) provided protective titers of neutralizing antibody (> 0.5 IU/mL) in 158/160 patients (8, 9, 13-16) within 14 days and in 215/216 patients by day 28 - 38.

Of these, 203 were followed for at least 10 months. No case of rabies was observed (8, 9, 13-20). Some patients received Human Rabies Immune Globulin (HRIG), 20 - 30 IU per kg body weight, or Equine Rabies Immune Globulin (ERIG), 40 IU per kg body weight, at the time of the first dose. In most studies (8, 9, 13, 17), the addition of either HRIG or ERIG caused a slight decrease in GMTs which was neither clinically relevant nor statistically significant. In one study (16), patients receiving HRIG had significantly lower ($p < 0.05$) GMTs on day 14; however, again this was not clinically relevant. After day 14 there was no statistical significance.

The results of several studies of normal volunteers receiving the postexposure WHO regimen, i.e., "simulated" postexposure, show that with sampling by day 28 - 30, 205/208 vaccinees had protective titers > 0.5 IU/mL.

No postexposure vaccine failures have occurred in the United States since cell culture vaccines have been routinely used (1). Failures have occurred abroad, almost always after deviation from the recommended postexposure treatment protocol (21-24). In two cases with bites to the face, treatment failed although no deviation from the recommended postexposure treatment protocol appeared to have occurred (25).

Postexposure Treatment in Children
In a 10-year serosurveillance study, RabAvert has been administered to 91 children aged 1 to 5 years and 436 children and adolescents aged 6 to 20 years (19). The vaccine was effective in both age groups. None of these patients developed rabies.

One newborn has received RabAvert on an immunization schedule of days 0, 3, 7, 14 and 30; the antibody concentration on day 37 was 2.34 IU/mL. There were no clinically significant adverse events (26).

INDICATIONS AND USAGE
RabAvert is indicated for preexposure vaccination, in both primary series and booster dose, and for postexposure prophylaxis against rabies in all age groups.
Usually, an immunization series is initiated and completed with one vaccine product. No clinical studies have been conducted that document a change in efficacy or the frequency of adverse reactions when the series is completed with a second vaccine product. However, for booster immunization, RabAvert was shown to elicit protective antibody level responses in persons tested who received a primary series with HDCV (4,11).

A. Preexposure Vaccination - See Table 1
(see also **Dosage and Administration** section below)
Preexposure vaccination consists of three doses of RabAvert 1.0 mL, intramuscularly (deltoid region), one each on days 0, 7, and 21 or 28 (1) (see also Table 1 for criteria for preexposure vaccination).
Preexposure vaccination does not eliminate the need for additional therapy after a known rabies exposure (see also **Dosage and Administration** section, subsection C).
Preexposure vaccination should be offered to persons in high-risk groups, such as veterinarians, animal handlers, wildlife officers in areas where animal rabies is enzootic, certain laboratory workers, and persons spending time in foreign countries where rabies is endemic. Persons whose activities bring them into contact with potentially rabid dogs, cats, foxes, skunks, bats, or other species at risk of having rabies should also be considered for preexposure vaccination. International travelers might be candidates for preexposure vaccination if they are likely to come in contact with animals in areas where dog rabies is enzootic and immediate access to appropriate medical care, including biologics, might be limited (27, 28)

Preexposure vaccination is given for several reasons. First, it may provide protection to persons with inapparent exposure to rabies. Second, it may protect persons whose postexposure therapy might be expected to be delayed. Finally, although it does not eliminate the need for prompt therapy after a rabies exposure, it simplifies therapy by eliminating the need for globulin and decreasing the number of doses of vaccine needed. This is of particular importance for persons at high risk of being exposed in countries where the available rabies immunizing products may carry a higher risk of adverse reactions.

In some instances, booster doses of vaccine should be administered to maintain a serum titer corresponding to at least complete neutralization at a 1:5 serum dilution by the RFFIT (see Table 1); each booster immunization consists of a single dose. See **Clinical Pharmacology**. Serum antibody determinations to decide upon the need for a booster dose is suggested by the ACIP and is considered cost-effective.

Table 1: Rabies Preexposure prophylaxis guide – United States, 1999

Risk Category and Nature of Risk	**Typical Populations**	**Preexposure Recommendations**
Continuous. Virus present continuously, often in high concentrations. Specific exposures likely to go unrecognized. Bite, nonbite or aerosol exposure.	Rabies research lab workers,* rabies biologics production workers.	Primary course. Serologic testing every 6 months; booster vaccination if antibody titer is below acceptable level.*
Frequent. Exposure usually episodic, with source recognized, but exposure might be unrecognized. Bite, nonbite or aerosol exposure.	Rabies diagnostic lab workers,* spelunkers, veterinarians and staff, and animal-control and wildlife workers in rabies enzootic areas.	Primary course. Serologic testing every 2 years; booster vaccination if antibody titer is below acceptable level.**
Infrequent (greater than population-at-large). Exposure nearly always episodic with source recognized. Bite or nonbite exposure.	Veterinarians and animal- control and wildlife workers in areas with low rabies rates. Veterinary students. Travelers visiting areas where rabies in enzootic and immediate access to appropriate medical care including biologics is limited.	Primary course. No serologic testing or booster vaccination.**
Rare (population-at-large). Exposures always episodic. with source recognized. Bite or nonbite exposure.	US population-at-large, including persons in rabies-epizootic areas.	No vaccination necessary.

Adapted from the Recommendations of the Advisory Committee on Immunization Practices: Human Rabies Prevention – United States, 1999. (1)

* Judgment of relative risk and extra monitoring of vaccination status of laboratory workers is the responsibility of the laboratory supervisor (29).

** Minimum acceptable antibody level is complete virus neutralization at a 1:5 serum dilution by RFFIT. A booster dose should be administered if the titer falls below this level.

B. Postexposure Treatment - See Table 2

(see also **Dosage and Administration** section below)

The following recommendations are only a guide. In applying them, take into account the animal species involved, the circumstances of the bite or other exposure, the immunization status of the animal, and presence of rabies in the region (as outlined below). Local or state public health officials should be consulted if questions arise about the need for rabies prophylaxis (1).

TABLE 2: RABIES POSTEXPOSURE PROPHYLAXIS GUIDE – UNITED STATES, 1999

Animal type	**Evaluation and disposition of animal**	**Postexposure prophylaxis recommendations**
Dogs, cats and ferrets	Healthy and available for 10 days observation Rabid or suspected rabid Unknown (e.g., escaped)	Should not begin prophylaxis unless animal develops clinical signs of rabies* Immediately vaccinate Consult public health officials
Skunks, raccoons, bats, foxes, and most other carnivores	Regarded as rabid unless animal proven negative by laboratory tests**	Consider immediate vaccination
Livestock, small rodents, lagomorphs (rabbits and hares), large rodents (woodchucks and beavers), and other mammals	Consider individually	Consult public health officials. Bites of squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, mice, other small rodents, rabbits, and hares almost never require antirabies postexposure prophylaxis

Adapted from the Recommendations of the Advisory Committee on Immunization Practices: Human Rabies Prevention – United States, 1999. (1)

* During the 10-day observation period, begin postexposure prophylaxis at the first sign of rabies in a dog, cat or ferret that has bitten someone. If the animal exhibits clinical signs of rabies, it should be euthanized immediately and tested.

** The animal should be euthanized and tested as soon as possible. Holding for observation is not recommended. Discontinue vaccine if immunofluorescence test results of the animal are negative.

In the United States, the following factors should be considered before antirabies treatment is initiated.

Species of Biting Animal

Wild terrestrial animals (especially skunks, raccoons, foxes and coyotes) and bats are the animals most commonly infected with rabies and are the most important potential source of infection for both humans and domestic animals. Unless a wild animal is tested and shown not to be rabid, postexposure prophylaxis should be initiated upon bite or nonbite exposure to the animals (see definition in "Type of Exposure" below). If treatment has been initiated and subsequent testing in a qualified laboratory shows the exposing animal is not rabid, postexposure prophylaxis can be discontinued (1).

The likelihood of rabies in a domestic animal varies from region to region; hence the need for postexposure prophylaxis also varies (1).

Small rodents (such as squirrels, hamsters, guinea pigs, gerbils, chipmunks, rats, and mice) and lagomorphs (including rabbits and hares) are almost never found to be infected with rabies and have not been known to transmit rabies to humans in the United States. Bites from large rodents such as woodchucks (including groundhogs) and beavers, should be considered as possible rabies exposures, especially in regions where rabies is enzootic in raccoons (30). In all cases involving rodents, the state or local health department should be consulted before a decision is made to initiate antirabies postexposure prophylaxis (1).

Circumstances of Biting Incident

An UNPROVOKED attack is more likely than a provoked attack to indicate the animal is rabid. Bites inflicted on a person attempting to feed or handle an apparently healthy animal should generally be regarded as PROVOKED. A currently vaccinated dog, cat or ferret is unlikely to become infected with rabies (1).

Type of Exposure

Rabies is transmitted by introducing the virus into open cuts or wounds in skin or via mucous membranes. The likelihood of rabies infection varies with the nature and extent of exposure. Two categories of exposure should be considered:

Bite: Any penetration of the skin by teeth. Bites to highly innervated areas such as the face and hands carry the highest risk, but the site of the bite should not influence the decision to begin treatment. Recent epidemiologic data suggest that even the very limited injury inflicted by a bat bite (compared to lesions caused by terrestrial carnivores) should prompt consideration of postexposure prophylaxis unless the bat is available for testing and is negative for evidence of rabies (1).

Nonbite: The contamination of open wounds, abrasions, mucous membranes, or theoretically, scratches, with saliva or other potentially infectious material (such as neural tissue) from a rabid animal constitutes a nonbite exposure. In all instances of potential human exposures involving bats, and the bat is not available for testing, postexposure prophylaxis might be appropriate even if a bite, scratch or mucous membrane exposure is not apparent when there is reasonable probability that such exposure might have occurred. Postexposure prophylaxis can be considered for persons who were in the same room as the bat and who might be unaware that a bite or direct contact had occurred (e.g., a sleeping person awakens to find a bat in the room or an adult witnesses a bat in the room with a previously unattended child, mentally disabled person, or intoxicated person) and rabies cannot be ruled out by testing the bat. Other contact by itself, such as petting a rabid animal and contact with blood, urine, or feces (e.g., guano) of a rabid animal, does not constitute an exposure and is not an indication for prophylaxis. Because the rabies virus is inactivated by desiccation and ultraviolet irradiation, in general, if the material containing the virus is dry, the virus can be considered noninfectious. Two cases of rabies have been attributed to probable aerosol exposures in laboratories, and two cases of rabies in Texas could possibly have been due to airborne exposures in caves containing millions of bats (1).

The only documented cases for rabies from human-to-human transmission occurred in eight patients, including two in the USA, who received corneas transplanted from persons who died of rabies undiagnosed at the time of death (1). Stringent guidelines for acceptance of donor corneas have been implemented to reduce this risk.

Bite and nonbite exposure from humans with rabies theoretically could transmit rabies, but no laboratory-diagnosed cases occurring under such situations have been documented. Each potential exposure to human rabies should be carefully evaluated to minimize unnecessary rabies prophylaxis (1).

Postexposure Treatment Schedule

(see also **Dosage and Administration** section below)

The essential components of rabies postexposure prophylaxis are prompt local treatment of wounds and administration of both Human Rabies Immune Globulin (HRIG) and vaccine.

A complete course of postexposure treatment for previously unvaccinated adults and children consists of a total of 5 doses of vaccine, each 1.0 mL: one IM injection (deltoid) on each of days 0, 3, 7, 14 and 28. For previously immunized adults and children, a total of 2 doses of vaccine, each 1.0 mL: one IM injection (deltoid) on each of days 0 and 3. No HRIG should be administered to previously vaccinated persons as it may blunt their rapid memory response to rabies antigen.

1. Local Treatment of Wounds
Immediate and thorough washing of all bite wounds and scratches with soap and water is an important measure for preventing rabies. In animal studies, thorough local wound cleansing alone has been shown to reduce markedly the likelihood of rabies. Whenever possible, bite injuries should not be sutured to avoid further and/or deeper contamination. Tetanus prophylaxis and measures to control bacterial infection should be given as indicated (1).

2. Postexposure Prophylaxis of Rabies
The regimen for postexposure prophylaxis depends on whether or not the patient has been previously immunized against rabies (see below). For persons who have not previously been immunized against rabies, the schedule consists of an initial injection IM of HRIG exactly 20 IU per kilogram body weight in total. If anatomically feasible, the FULL DOSE of HRIG should be thoroughly infiltrated in the area around and into the wounds. Any remaining volume of HRIG should be injected IM at a site distant from rabies vaccine administration. HRIG should never be administered in the same syringe or in the same anatomical site as the rabies vaccine. HRIG is administered only once (for specific instructions for HRIG use, see the product package insert). The HRIG injection is followed by a series of 5 individual injections of RabAvert (1.0 mL each) given IM on days 0, 3, 7, 14 and 28. Postexposure rabies prophylaxis should begin the same day exposure occurred or as soon after exposure as possible. The combined use of HRIG and RabAvert is recommended by the CDC for both bite and non-bite exposures, regardless of the interval between exposure and initiation of treatment.

In the event that HRIG is not readily available for the initiation of treatment, it can be given through the seventh day after administration of the first dose of vaccine. HRIG is not indicated beyond the seventh day because an antibody response to RabAvert is presumed to have begun by that time (1).

The sooner treatment is begun after exposure, the better. However, there have been instances in which the decision to begin treatment was made as late as 6 months or longer after exposure due to delay in recognition that an exposure had occurred. Postexposure antirabies treatment should always include administration of both passive antibody (HRIG) and immunization, with the exception of persons who have previously received complete immunization regimens (preexposure or postexposure) with a cell culture vaccine, or persons who have been immunized with other types of vaccines and have had documented rabies antibody titers. Persons who have previously received rabies immunization should receive 2 IM doses of RabAvert: 1 on day 0 and another on day 3. They should not be given HRIG as this may blunt their rapid memory response to rabies antigen.

3. Postexposure Prophylaxis Outside the United States
If postexposure treatment is begun outside the United States with regimens or biologics that are not used in the United States, it may be prudent to provide additional treatment when the patient reaches the USA. State or local health departments should be contacted for specific advice in such cases (1).

CONTRAINDICATIONS
In view of the almost invariably fatal outcome of rabies, there is no contraindication to postexposure prophylaxis, including pregnancy (1).

Hypersensitivity
History of anaphylaxis to the vaccine or any of the vaccine components constitutes a contraindication to preexposure vaccination with this vaccine.
In the case of postexposure prophylaxis, if an alternative product is not available, the patient should be vaccinated with caution with the necessary medical equipment and emergency supplies available and observed carefully after vaccination. A patient's risk of acquiring rabies must be carefully considered before deciding to discontinue vaccination. Advice and assistance on the management of serious adverse reactions for persons receiving rabies vaccines may be sought from the state health department or CDC.

WARNINGS
Anaphylaxis, encephalitis including death, meningitis, neuroparalytic events such as encephalitis, transient paralysis, Guillain-Barre Syndrome, myelitis, and retrobulbar neuritis; and multiple sclerosis have been reported to be temporally associated with the use of RabAvert. See **Precautions** and **Adverse Events** sections. A patient's risk of developing rabies must be carefully considered, however, before deciding to discontinue immunization.
RABAVERT MUST NOT BE USED SUBCUTANEOUSLY OR INTRADERMALLY.

RabAvert must be injected intramuscularly. For adults, the deltoid area is the preferred site of immunization; for small children and infants, administration into the anterolateral zone of the thigh is preferred. The use of the gluteal region should be avoided, since administration in this area may result in lower neutralizing antibody titers (1).
DO NOT INJECT INTRAVASCULARLY.
Unintentional intravascular injection may result in systemic reactions, including shock. Immediate measures include catecholamines, volume replacement, high doses of corticosteroids, and oxygen.
Development of active immunity after vaccination may be impaired in immune-compromised individuals. Please refer to **Drug Interactions**, under **Precautions**.
This product contains albumin, a derivative of human blood. It is present in RabAvert at concentrations of less than 0.3 mg/dose. Based on effective donor screening and product manufacturing processes, it carries an extremely remote risk for transmission of viral diseases. A theoretical risk for transmission of Creutzfeld-Jakob disease (CJD) also is considered extremely remote. No cases of transmission of viral diseases or CJD have ever been identified for albumin.

PRECAUTIONS

General
Care is to be taken by the health care provider for the safe and effective use of the product. The health care provider should also question the patient, parent or guardian about 1) the current health status of the vaccinee; and 2) reactions to a previous dose of RabAvert, or a similar product. Preexposure vaccination should be postponed in the case of sick and convalescent persons, and those considered to be in the incubation stage of an infectious disease. A separate, sterile syringe and needle or a sterile disposable unit should be used for each patient to prevent transmission of hepatitis and other infectious agents from person to person. Needles should not be recapped and should be properly disposed of. As with any rabies vaccine, vaccination with RabAvert may not protect 100% of susceptible individuals.

Hypersensitivity
At present there is no evidence that persons are at increased risk if they have egg hypersensitivities that are not anaphylactic or anaphylactoid in nature. Although there is no safety data regarding the use of RabAvert in patients with egg allergies, experience with other vaccines derived from primary cultures of chick embryo fibroblasts demonstrates that documented egg hypersensitivity does not necessarily predict an increased likelihood of adverse reactions. There is no evidence to indicate that persons with allergies to chickens or feathers are at increased risk of reaction to vaccines produced in primary cultures of chick embryo fibroblasts.
Since reconstituted RabAvert contains processed bovine gelatin and trace amounts of chicken protein, neomycin, chlortetracycline and amphotericin B, the possibility of allergic reactions in individuals hypersensitive to these substances should be considered when administering the vaccine.
Epinephrine injection (1:1000) must be immediately available should anaphylactic or other allergic reactions occur.
When a person with a history of hypersensitivity must be given RabAvert, antihistamines may be given; epinephrine (1:1000), volume replacement, corticosteroids and oxygen should be readily available to counteract anaphylactic reactions.

Drug Interactions
Radiation therapy, antimalarials, corticosteroids, other immunosuppressive agents and immunosuppressive illnesses can interfere with the development of active immunity after vaccination, and may diminish the protective efficacy of the vaccine. Preexposure vaccination should be administered to such persons with the awareness that the immune response may be inadequate. Immunosuppressive agents should not be administered during postexposure therapy unless essential for the treatment of other conditions. When rabies postexposure prophylaxis is administered to persons receiving corticosteroids or other immunosuppressive therapy, or who are immunosuppressed, it is important that a serum sample on day 14 (the day of the fourth vaccination) be tested for rabies antibody to ensure that an acceptable antibody response has been induced (1).
HRIG must not be administered at more than the recommended dose, since active immunization to the vaccine may be impaired.
No data are available regarding the concurrent administration of RabAvert with other vaccines.

Carcinogenesis, Mutagenesis, Impairment of Fertility
Long-term studies with RabAvert have not been conducted to assess the potential for carcinogenesis, mutagenesis, or impairment of fertility.

Use in Pregnancy
Pregnancy Category C. Animal reproductive studies have not been conducted with RabAvert. It is also not known whether RabAvert can cause fetal harm when administered to a pregnant woman or can affect reproduction capacity. RabAvert should be given to a pregnant woman only if clearly needed. The ACIP has issued recommendations for use of rabies vaccine in pregnant women (1).

Use in Nursing Mothers
It is not known whether RabAvert is excreted in animal or human milk, but many drugs are excreted in human milk. Although there are no data, because of the potential consequences of inadequately treated rabies exposure, nursing is not considered a contraindication

to postexposure prophylaxis. If the risk of exposure to rabies is substantial, preexposure vaccination might also be indicated during nursing.

Pediatric Use
Children and infants receive the same dose of 1 mL, given IM, as do adults.
Only limited data on the safety and efficacy of RabAvert in the pediatric age group are available. However, in three studies some preexposure and postexposure experience has been gained (12, 19, 26; see also **Clinical Studies in Clinical Pharmacology** section).

Geriatric Use
Clinical studies of RabAvert did not include sufficient numbers of subjects aged 65 and over to determine whether they respond differently from younger subjects. Other reported clinical experience has not identified differences in responses between the elderly and younger patients.

ADVERSE REACTIONS
In very rare cases, neurological and neuroparalytical events have been reported in temporal association with administration of RabAvert (see also **Warnings** section). These include cases of hypersensitivity (see **Contraindications, Warnings, and Precautions** sections).
The most commonly occurring adverse reactions are injection site reactions, such as injection site erythema, induration and pain; flu-like symptoms, such as asthenia, fatigue, fever, headache, myalgia and malaise; arthralgia, dizziness, lymphadenopathy, nausea, and rash.
A patient's risk of acquiring rabies must be carefully considered before deciding to discontinue vaccination. Advice and assistance on the management of serious adverse reactions for persons receiving rabies vaccines may be sought from the state health department or CDC (see also **Contraindications** section).
Local reactions such as induration, swelling and reddening have been reported more often than systemic reactions. In a comparative trial in normal volunteers, Dreesen *et al.* (4) described their experience with RabAvert compared to a HDCV rabies vaccine. Nineteen subjects received RabAvert and 20 received HDCV. The most commonly reported adverse reaction was pain at the injection site, reported in 45% of the HDCV group, and 34% of the RabAvert group. Localized lymphadenopathy was reported in about 15% of each group. The most common systemic reactions were malaise (15 % RabAvert group vs. 25 % HDCV group), headache (10 % RabAvert group vs. 20 % HDCV group), and dizziness (15 % RabAvert group vs. 10 % HDCV group). In a recent study in the USA (5), 83 subjects received RabAvert and 82 received HDCV. Again, the most common adverse reaction was pain at the injection site in 80% in the HDCV group and 84% in the RabAvert group. The most common systemic reactions were headache (52% RabAvert group vs. 45% HDCV group), myalgia (53% RabAvert group vs. 38% HDCV group) and malaise (20% RabAvert group vs. 17% HDCV group). None of the adverse events were serious, almost all adverse events were of mild or moderate intensity. Statistically significant differences between vaccination groups were not found. Both vaccines were generally well tolerated.
Uncommonly observed adverse events include temperatures above 38°C (100°F), swollen lymph nodes, pain in limbs and gastrointestinal complaints. In rare cases, patients have experienced severe headache, fatigue, circulatory reactions, sweating, chills, monoarthritis and allergic reactions; transient paresthesias and one case of suspected urticaria pigmentosa have also been reported.

Observed During Clinical Practice (See Warnings and Precautions)
The following adverse reactions have been identified during post approval use of RabAvert. Because these reactions are reported voluntarily from a population of uncertain size, estimates of frequency cannot be made. These events have been chosen for inclusion due to their seriousness, frequency of reporting, causal connection to RabAvert, or a combination of these factors:

Allergic: Anaphylaxis, Type III hypersensitivity-like reactions, bronchospasm, urticaria, pruritis, edema

CNS: Neuroparalysis, encephalitis, meningitis, transient paralysis, Guillain-Barre Syndrome, myelitis, retrobulbar neuritis, multiple sclerosis, vertigo, visual disturbance

Cardiac: Palpitations, hot flush

Local: Extensive limb swelling

The use of corticosteroids to treat life-threatening neuroparalytic reactions may inhibit the development of immunity to rabies (see **Precautions, Drug Interactions**).
Once initiated, rabies prophylaxis should not be interrupted or discontinued because of local or mild systemic adverse reactions to rabies vaccine. Usually such reactions can be successfully managed with anti-inflammatory and antipyretic agents.

Reporting of Adverse Events
Adverse events should be reported by the health care provider or patient to the US Department of Health and Human Services (DHHS) Vaccine Adverse Event Reporting System (VAERS). Report forms and information about reporting requirements or completion of the form can be obtained from VAERS by calling the toll-free number 1-800-822-7967 (1). In the USA, such events can be reported to the Professional Services department, Novartis Vaccines and Diagnostics, Inc.: phone: 1-800-244-7668.

DOSAGE AND ADMINISTRATION

The individual dose for adults, children, and infants is 1 mL, given intramuscularly.
In adults, administer vaccine by IM injection into the deltoid muscle. In small children and infants, administer vaccine into the anterolateral zone of the thigh. The gluteal area should be avoided for vaccine injections, since administration in this area may result in lower neutralizing antibody titers. Care should be taken to avoid injection into or near blood vessels and nerves. After aspiration, if blood or any suspicious discoloration appears in the syringe, do not inject but discard contents and repeat procedure using a new dose of vaccine, at a different site.

A. Preexposure Dosage

1. Primary Immunization
In the United States, the Advisory Committee on Immunization Practices (ACIP) recommends three injections of 1.0 mL each: one injection on day 0 and one on day 7, and one either on day 21 or 28 (for criteria for preexposure vaccination, see Table 1).

2. Booster Immunization
The individual booster dose is 1 mL, given intramuscularly.

Booster immunization is given to persons who have received previous rabies immunization and remain at increased risk of rabies exposure by reasons of occupation or avocation.

Persons who work with live rabies virus in research laboratories or vaccine production facilities (continuous-risk category: see Table 1) should have a serum sample tested for rabies antibodies every 6 months. The minimum acceptable antibody level is complete virus neutralization at a 1:5 serum dilution by the rapid fluorescent focus inhibition test (RFFIT). A booster dose should be administered if the titer falls below this level.

The frequent-risk category includes other laboratory workers such as those doing rabies diagnostic testing, spelunkers, veterinarians and staff, animal-control and wildlife officers in areas where rabies is epizootic. Persons in the frequent-risk category should have a serum sample tested for rabies antibodies every 2 years and, if the titer is less than complete neutralization at a 1:5 serum dilution by RFFIT, should have a booster dose of vaccine. Alternatively, a booster can be administered in the absence of a titer determination.

The infrequent-risk category, including veterinarians, animal-control and wildlife officers working in areas of low rabies enzooticity (infrequent-exposure group) and international travelers to rabies enzootic areas do not require routine preexposure booster doses of RabAvert after completion of a full primary preexposure vaccination scheme (Table 1).

B. Postexposure Dosage

Immunization should begin as soon as possible after exposure. A complete course of immunization consists of a total of 5 injections of 1 mL each: one injection on each of days 0, 3, 7, 14 and 28 in conjunction with the administration of HRIG on day 0. For children, see **Pediatric Use** section under **Precautions**.
Begin with the administration of HRIG. Give 20 IU/kg body weight.
This formula is applicable to all age groups, including infants and children. The recommended dosage of HRIG should not exceed 20 IU/kg body weight because it may otherwise interfere with active antibody production. Since vaccine-induced antibody appears within 1 week, HRIG is not indicated more than 7 days after initiating postexposure prophylaxis with RabAvert. If anatomically feasible, the FULL DOSE of HRIG should be thoroughly infiltrated in the area around and into the wounds. Any remaining volume of HRIG should be injected IM at a site distant from rabies vaccine administration. HRIG should never be administered in the same syringe or in the same anatomical site as the rabies vaccine.
Because the antibody response following the recommended immunization regimen with RabAvert has been satisfactory, routine post-immunization serologic testing is not recommended. Serologic testing is indicated in unusual circumstances, as when the patient is known to be immunosuppressed. Contact the appropriate state health department or the CDC for recommendations.

C. Postexposure Prophylaxis of Previously Immunized Persons

When rabies exposure occurs in a previously vaccinated person, then that person should receive two IM (deltoid) doses (1.0 mL each) of RabAvert: one immediately and one 3 days later. HRIG should not be given in these cases. Persons considered to have been immunized previously are those who received a complete preexposure vaccination or postexposure prophylaxis with RabAvert or other tissue culture vaccines or have been documented to have had a protective antibody response to another rabies vaccine. If the immune status of a previously vaccinated person is not known, full postexposure antirabies treatment (HRIG plus 5 doses of vaccine) is recommended. In such cases, if a protective titer can be demonstrated in a serum sample collected before vaccine is given, treatment can be discontinued after at least two doses of vaccine.

Instructions for Reconstituting RabAvert

Using the longer of the 2 needles supplied, withdraw the entire contents of the Sterile Diluent for RabAvert into the syringe. Insert the needle at a 45° angle and slowly inject the entire contents of the diluent vial into the vaccine vial. Mix gently to avoid foaming.

The white, freeze-dried vaccine dissolves to give a clear or slightly opaque suspension. Withdraw the total amount of dissolved vaccine into the syringe and replace the long needle with the smaller needle for IM injection. The reconstituted vaccine should be used immediately.
Parenteral drug products should be inspected visually for particulate matter and discoloration prior to administration. If either of these conditions exists, the vaccine should not be administered. A separate, sterile syringe and needle or a sterile disposable unit should be used for each patient to prevent transmission of hepatitis and other infectious agents from person to person. Needles should not be recapped and should be properly disposed of.
The lyophilization of the vaccine is performed under reduced pressure and the subsequent closure of the vials needs to be done under vacuum. Additionally, if there is no negative pressure in the vial, injection of Sterile Diluent for RabAvert would lead to an excess positive pressure in the vial. After reconstitution of the vaccine, it is recommended to unscrew the syringe from the needle to eliminate the negative pressure. After that, the vaccine can be easily withdrawn from the vial. It is not recommended to induce excess pressure, since over-pressurization will create the problems in withdrawing the proper amount of the vaccine.

HOW SUPPLIED
Package with:

1 vial of freeze-dried vaccine containing a single dose

1 vial of Sterile Diluent for RabAvert (1 mL)

1 disposable syringe

1 smaller needle for injection, 25 gauge × 1 "

1 longer needle for reconstitution, 21 gauge ×1.5 "

N.D.C.# 63851-501-01
CAUTION: Federal law prohibits dispensing without a prescription

Storage
RabAvert should be stored protected from light at 2°C to 8°C (36°F to 46°F). After reconstitution the vaccine is to be used immediately. The vaccine may not be used after the expiration date given on package and container.

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Rev. 10/06

VIAL LABEL – PRINCIPAL DISPLAY PANEL
Rabies Vaccine

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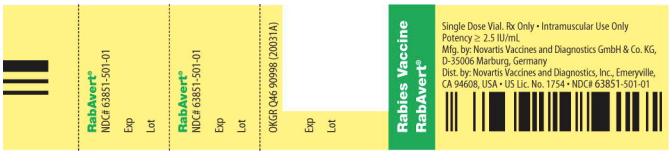

PACKAGE LABEL – PRINCIPAL DISPLAY PANEL
Single dose freeze-dried vaccine.
Pre- and post-exposure intramuscular immunization only.
Rx Only
NDC 63851-501-01
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Rabies Vaccine for Human Use.
Contains: Vial with Sterile Diluent for RabAvert®.
Disposable syringe.
Longer needle for reconstitution.
Smaller needle for injection.
FOR INTRAMUSCULAR INJECTION.
See enclosed instructions.
The virus is propagated in Chick Embryo Cells
and inactivated with ß-propiolactone.
Store at 2°C to 8°C (36°F to 46°F).
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The potency of 1 dose (1.0 mL) RabAvert®, rabies vaccine for human use,
is at least 2.5 IU of rabies antigen.
The vaccine contains no preservative and should be used immediately
after reconstitution.
Concentration of antibiotics in the final vaccine product (per dose):
neomycin <1 µg, chlortetracycline <20 ng, amphotericin B <2 ng.